

MDX-C150/C150RDS

SERVICE MANUAL

E Model
MDX-C150
AEP Model
UK Model
MDX-C150RDS

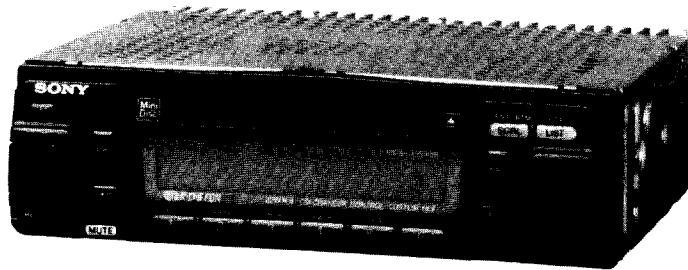


Photo: MDX-C150RDS



Model Name Using Similar Mechanism	NEW
Optical Pick-up Name	KMS-193A/J-N

SPECIFICATIONS

MD player section

Signal-to-noise ratio 90 dB
Frequency response 20 – 20,000 Hz
Wow and flutter Below measurable limit

Tuner section

FM

Tuning range 87.5 – 108.0 MHz
Antenna terminal External antenna connector
Intermediate frequency 10.7 MHz
Usable sensitivity 8 dBf
Selectivity 75 dB at 400 kHz
Signal-to-noise ratio 60 dB (stereo),
70 dB (mono)

Harmonic distortion at 1 kHz

0.5 % (stereo),
0.3 % (mono)

Separation 35 dB at 1 kHz
Frequency response 30 – 15,000 Hz
Capture ratio 2 dB

AM (MDX-C150)

Tuning range AM tuning interval:
9 kHz/10 kHz switchable
531 – 1,602 kHz (at 9 kHz step)
530 – 1,710 kHz (at 10 kHz
step)

MW/LW (MDX-C150RDS)

Tuning range MW: 531 – 1,602 kHz
LW: 153 – 281 kHz
Antenna terminal External antenna connector
Intermediate frequency 10.71 MHz/450 kHz
Sensitivity AM: 30 μ V
MW: 38 μ V
LW: 45 μ V

Power amplifier section

Outputs Speaker outputs
(sure seal connectors)
Speaker impedance 4 – 8 ohms
Maximum power output 22 W \times 4 (at 4 ohms)

General

Output lead Power antenna relay
control lead
Power amplifier control
lead
Tone controls Bass \pm 8 dB at 100 Hz
Treble \pm 8 dB at 10 kHz
Power requirements 12 V DC car battery
(negative ground)
Dimensions Approx. 178 \times 50 \times 170 mm
(w/h/d)
Mounting dimension Approx. 178 \times 50 \times 154 mm
(w/h/d)
Mass Approx. 1.2 kg
Supplied accessories Power connecting cord (1)
Mounting hardware (1 set)
Front panel case (1)

*U.S. and foreign patents licensed from Dolby laboratories
Licensing Corporation.*

*Design and specifications are subject to change without
notice.*

MDX-C150
FM/AM MINIDISC PLAYER

MDX-C150RDS
FM/MW/LW MINIDISC PLAYER

SONY®





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CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK  OR DOTTED LINE WITH MARK  ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

This section is extracted from instruction manual.

SECTION 1 GENERAL

Installation

Precautions

- Do not tamper with the four holes on the upper surface of the unit. They are for tuner adjustments to be done only by service technicians.
- Choose the installation location carefully so that the unit will not hamper the driver during driving.
- Avoid installing the unit where it would be subject to high temperatures, such as from direct sunlight or hot air from the heater, or where it would be subject to dust, dirt or excessive vibration.
- Use only the supplied mounting hardware for a safe and secure installation.

Mounting angle adjustment

Adjust the mounting angle to less than 30°.

Installation

Précautions

- Ne pas toucher les quatre orifices sur le panneau supérieur de l'appareil. Ils servent aux réglages du tuner qui ne doivent être effectués que par un technicien.
- Choisir soigneusement l'emplacement de l'installation, pour que l'appareil ne gêne pas la conduite.
- Éviter d'installer l'appareil dans un endroit exposé à des températures élevées, comme en plein soleil ou à proximité d'une bouche d'air chaud, ou à de la poussière, saleté ou vibrations violentes.
- Pour garantir un montage sûr, n'utiliser que le matériel fourni.

Réglage de l'angle de montage

Ajuster l'inclinaison à un angle inférieur à 30°.

Installation

Vorsichtsmaßnahmen

- Nehmen Sie an den vier Öffnungen an der Oberseite des Geräts keine Einstellungen vor. Diese Öffnungen dienen dem Tuner-Abgleich; der Abgleich darf nur von einem Fachmann vorgenommen werden.
- Wählen Sie den Einbaort sorgfältig so aus, daß das Gerät die Bedienung des Fahrzeugs nicht behindert.
- Bauen Sie das Gerät so ein, daß es keinen hohen Temperaturen (keinem direkten Sonnenlicht, keiner Warmluft von der Heizung), keinem Staub, keinem Schmutz und keinen starken Vibrationen ausgesetzt ist.
- Für eine sichere Befestigung verwenden Sie stets nur die mitgelieferten Montageteile.

Hinweis zum Montagewinkel

Das Gerät sollte in einem Winkel von weniger als 30° montiert werden.

Installazione

Precauzioni

- Non toccare i quattro fori sulla superficie superiore dell'apparecchio. Servono per regolazioni del sintonizzatore che devono essere eseguite solo da tecnici per la manutenzione.
- Scegliere con attenzione il luogo di montaggio in modo che l'apparecchio non interferisca con le normali operazioni di guida del conducente.
- Evitare di installare l'apparecchio dove sia soggetto ad alte temperature, come da esposizione alla luce solare diretta o al getto di aria calda dell'impianto di riscaldamento, o dove possa essere soggetto a polvere, sporco e vibrazioni eccessive.
- Usare solo il materiale di montaggio in dotazione per un'installazione stabile e sicura.

Regolazione dell'angolo di montaggio

Regolare l'angolo di montaggio in modo che sia inferiore a 30°.

How to Detach and Attach the Front Panel

Before installing the unit, detach the front panel.

Retrait et pose de la façade

Avant d'installer l'appareil, déposer la façade.

Abnehmen und Anbringen der Frontplatte

Nehmen Sie die Frontplatte vor dem Einbau des Geräts ab.

Come staccare e attaccare il pannello anteriore

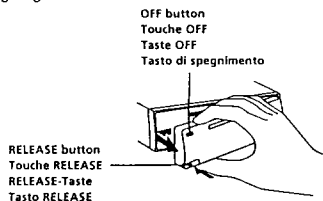
Prima di installare l'apparecchio staccare il pannello anteriore.

To detach

Before detaching the front panel, be sure to press the OFF button to turn off the unit. Then press the RELEASE button, slide the front panel a little to the left, and pull it off toward you.

Zum Abnehmen

Drücken Sie zuerst die Taste OFF, um das Gerät auszuschalten. Zum Lösen der Frontplatte drücken Sie dann die RELEASE-Taste, schieben die Frontplatte ein wenig nach links und ziehen sie wie in der Abbildung gezeigt ab.



Retrait

Avant de détacher la façade, appuyez sur la touche OFF pour arrêter l'appareil. Ensuite, appuyez sur la touche RELEASE, poussez la façade légèrement vers la gauche et tirez vers vous pour l'enlever.

Per togliere

Prima di togliere il pannello anteriore, premere il tasto OFF e spegnere l'apparecchio. Quindi premere il tasto RELEASE, spingere lievemente il pannello verso sinistra e tirarlo verso di sé.

To attach

Align the parts ④ and ⑤, and push the front panel until it clicks.

Zum Anbringen

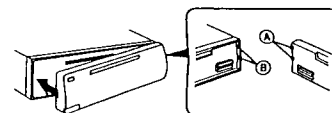
Richten Sie Teil ④ auf Teil ⑤ aus, und drücken Sie die Frontplatte fest, so daß sie mit einem Klicken einrastet.

Pose

Aligner les points ④ et ⑤, puis pousser l'appareil jusqu'au dé clic.

Per attaccare

Allineare le parti ④ e ⑤ e spingere il pannello anteriore fino a udire uno scatto.



Mounting Example

Installation in the dashboard

Exemple de montage

Installation dans le tableau de bord

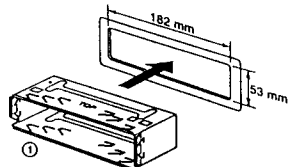
Einbaubeispiel

Installation im Armaturenbrett

Esempio di montaggio

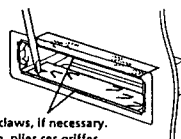
Installazione nel cruscotto

1



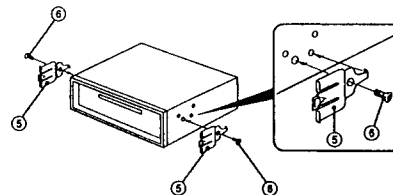
With the TOP marking up
Avec l'inscription TOP vers le haut
Mit der TOP-Markierung nach oben hinweisend
Con la scritta TOP rivolta verso l'alto

2

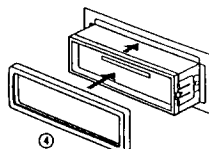


Bend these claws, if necessary.
Si nécessaire, plier ces griffes.
Falls erforderlich, die Klauen hochbiegen.
Piegare questi morsetti, se necessario.

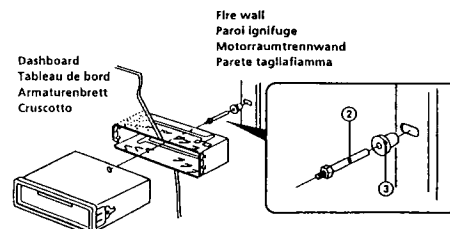
3



4



To support the unit
Pour installer l'appareil
Installation der Einheit
Per sorreggere l'apparecchio



Mounting the Unit in a Japanese Car

You may not be able to install this unit in some makes of Japanese cars. In such a case, consult your Sony dealer.

Installation de l'appareil dans une voiture japonaise

Si vous ne pouvez pas installer l'appareil dans une voiture japonaise, consultez votre revendeur Sony.

Montage in einem japanischen Fahrzeug

In einige japanische Fahrzeuge kann dieses Gerät nicht eingebaut werden. Genaueres erfahren Sie bei Ihrem Sony-Händler.

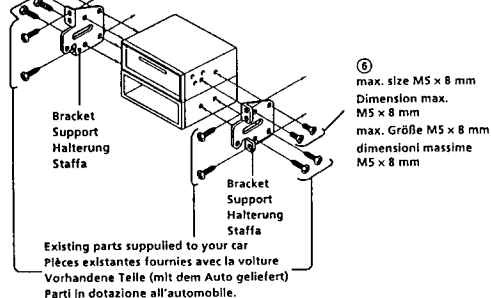
Montaggio dell'apparecchio su un'auto giapponese

Può non essere possibile installare questo apparecchio in alcune auto giapponesi. In questo caso, consultare il più vicino rivenditore Sony.

TOYOTA

⑥ max. size M5 x 8 mm
Dimension max.
M5 x 8 mm
max. Größe M5 x 8 mm
dimensioni massime
M5 x 8 mm

to dashboard/center console
au tableau de bord/console centrale
an Armaturenbrett/Mittelkonsole
al cruscotto/console centrale

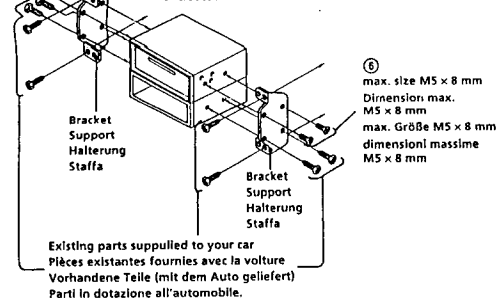


⑥ max. size M5 x 8 mm
Dimension max.
M5 x 8 mm
max. Größe M5 x 8 mm
dimensioni massime
M5 x 8 mm

NISSAN

⑥ max. size M5 x 8 mm
Dimension max.
M5 x 8 mm
max. Größe M5 x 8 mm
dimensioni massime
M5 x 8 mm

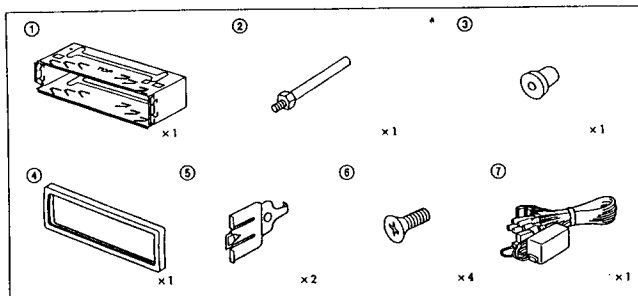
to dashboard/center console
au tableau de bord/console centrale
an Armaturenbrett/Mittelkonsole
al cruscotto/console centrale



⑥ max. size M5 x 8 mm
Dimension max.
M5 x 8 mm
max. Größe M5 x 8 mm
dimensioni massime
M5 x 8 mm

Parts for Installation and Connections Pièces de montage et de raccordement Montageteile und Anschlußzubehör Componenti per installazione e collegamenti

The numbers in the list are keyed to those in the instructions.
Les numéros de la liste correspondent à ceux des instructions.
Die Nummern in der Liste sind dieselben wie im Erläuterungstext.
I numeri nella lista corrispondono a quelli riportati nelle istruzioni.



Connections

Caution

- This unit is designed for negative ground 12 V DC operation only.
- Before making connections, disconnect the ground terminal of the car battery to avoid short circuits.
- Connect the yellow and red power input leads only after all other leads have been connected.
- Be sure to connect the red power input lead to the positive 12 V power terminal which is energized when the ignition key is in the accessory position.
- Run all ground wires to a common ground point.

If Your Car has No Accessory Position on the Ignition Key Switch — POWER SELECT Switch

The illumination on the front panel is factory-set to be turned on even when the unit is not being played. However, this setting may cause some car battery wear if your car has no accessory position on the ignition key switch. To avoid this battery wear, set the POWER SELECT switch located on the bottom of the unit to the OFF position, then press the reset button. The illumination is reset to stay off while the unit is not being played.

Note

The caution alarm for the front panel is not activated when the POWER SELECT switch is set to the OFF position.

Connexions

Précautions

- Cet appareil est conçu pour fonctionner sur courant continu de 12 V avec masse négative.
- Avant d'effectuer les connexions, débrancher la borne de terre de la batterie du véhicule pour éviter tout court-circuit.
- Brancher les fils d'entrée d'alimentation jaune et rouge seulement après avoir terminé tous les autres branchements.
- Veiller à ne pas raccorder le fil rouge d'entrée d'alimentation à la borne positive de 12 V qui est alimentée quand la clé de contact est sur la position accessoires.
- Rassembler tous les fils de terre en un point de masse commun.

Si l'appareil est utilisé dans une voiture dont la clé de contact n'a pas de position accessoires

— Interrupteur POWER SELECT

L'éclairage du panneau avant est réglé en usine de manière à s'allumer même quand l'appareil ne fonctionne pas. Cependant, ce réglage risque d'épuiser la batterie si l'appareil est utilisé dans une voiture dont la clé de contact ne possède pas de position accessoires. Pour éviter d'épuiser la batterie, régler l'interrupteur POWER sur le socle de l'appareil sur la position OFF, puis appuyer sur la touche de réinitialisation. L'éclairage est réglé pour rester éteint quand l'appareil n'est pas utilisé.

Remarque

Quand l'interrupteur POWER SELECT est réglé sur la position OFF, l'éclairage du panneau avant ne fonctionne pas.

Anschluß

Vorsicht

- Dieses Gerät ist ausschließlich für eine negativ geerdete 12-V-Autobatterie bestimmt.
- Trennen Sie vor dem Anschließen des Geräts die Erdungsklemme der Batterie ab, um einen Kurzschluß zu vermeiden.
- Schließen Sie das gelbe und rote Stromversorgungskabel erst an, wenn alle anderen Kabel bereits angeschlossen sind.
- Leiten Sie das rote Stromversorgungskabel an einen positiven 12-V-Kontakt, an dem Spannung anliegt, wenn sich das Zündschloß in der Position I bzw. ACC (Position vor der Zündposition) befindet.
- Schließen Sie alle Erdungskabel an einen gemeinsamen Massepunkt an.

Wenn das Zündschloß Ihres Wagens keine Position I bzw. ACC besitzt — POWER SELECT-Schalter

Das Gerät ist werkseitig so voreingestellt, daß das Bedienfeld auch dann beleuchtet ist, wenn das Gerät nicht betrieben wird. Besitzt das Zündschloß Ihres Fahrzeugs keine Position I bzw. ACC, so ist die Beleuchtung ständig eingeschaltet und entzieht der Batterie Strom. Stellen Sie in einem solchen Fall den POWER SELECT-Schalter an der Unterseite des Geräts auf Position OFF, und drücken Sie dann die Rücksetztaste. Bei ausgeschaltetem Gerät ist das Bedienfeld dann nicht mehr beleuchtet.

Hinweis

Der Warnton für die Frontplatte ertönt nicht, wenn der POWER SELECT-Schalter auf Position OFF gestellt ist.

Collegamenti

Attenzione

- Questo apparecchio è stato progettato per l'uso solo a 12 V CC con massa negativa.
- Prima di eseguire i collegamenti, scollegare il terminale di massa della batteria dell'auto per evitare cortocircuiti.
- Collegare i cavi di collegamento alimentazione rosso e giallo solo dopo aver collegato tutti gli altri cavi.
- Assicurarsi di collegare il cavo rosso di collegamento alimentazione al terminale di alimentazione 12 V positivo che è sotto tensione quando la chiavetta di accensione è in posizione accessoria.
- Portare tutti i cavi di massa a un punto di massa comune.

Quando si usa l'apparecchio in un'auto priva di posizione accessoria per la chiavetta di accensione

— Interruttore POWER SELECT

L'illuminazione del pannello anteriore è stata predisposta in fabbrica per l'attivazione anche quando non si usa l'apparecchio. Tuttavia questa regolazione può causare scaricamento della batteria dell'auto se si usa l'apparecchio in un'auto priva di posizione accessoria per la chiavetta di accensione. Per evitare ciò, regolare su OFF l'interruttore POWER SELECT situato alla base dell'apparecchio e quindi premere il tasto di azzeramento. L'illuminazione rimane così spenta finché l'apparecchio rimane spento.

Nota

La suoneria di avvertimento per il pannello anteriore non si attiva quando l'interruttore POWER SELECT è in posizione OFF.

Change the position with a jeweler's screwdriver, etc.
Changer la position avec un tournevis de joaillier ou un objet similaire.
Den Schalter mit einem kleinen Schraubenzieher o.ä. umstellen.
Cambiare la posizione con un cacciavite da gioielliere, ecc.



Reset Button

When the installation and connections are over, be sure to press the reset button with a ball-point pen etc.

Touche de réinitialisation

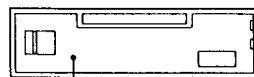
Quand l'installation et les connexions sont terminées, appuyer sur la touche de réinitialisation avec un stylo bille ou un objet pointu.

Rücksetztaste

Nach der Installation und dem Anschluß muß die Rücksetztaste mit einem Kugelschreiber o.ä. gedrückt werden.

Pulsante di azzeramento

Dopo avere terminato l'installazione e i collegamenti, assicurarsi di premere il pulsante di azzeramento con la punta di una penna a sfera ecc.



Reset button
Touche de réinitialisation
Rücksetztaste
Pulsante di azzeramento

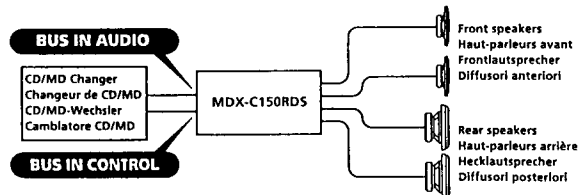
Connection Diagram

Schémas de connexion

Anschlußdiagramm

Schema di collegamento

Example 1/Exemple 1/Beispiel 1/Esempio 1



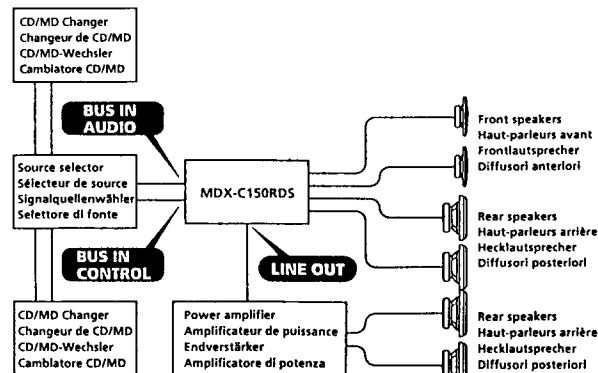
For connecting an MD changer, refer to the manual supplied with the MD changer.

Pour le raccordement d'un changeur MD, consultez le mode d'emploi fourni avec le changeur MD.

Hinweise über den Anschluß eines MD-Wechslers finden Sie im mit dem MD-Wechsler mitgelieferten Handbuch.

Per il collegamento dell'apparecchio ad un cambio MD, far riferimento al manuale fornito in dotazione al cambio MD.

Example 2/Exemple 2/Beispiel 2/Esempio 2



For connecting two or more changers, the source selector XA-U20 or XA-U40 (optional) and the BUS cable RC-61 (1 m) or RC-62 (2 m) (optional) are necessary.

Pour le raccordement de deux ou plusieurs changeurs, vous devez utiliser le sélecteur de source XA-U20 ou XA-U40 (optionnels) et le câble BUS RC-61 (1 m) ou RC-62 (2 m) (optionnels).

Zum Anschluß von zwei oder mehr Wechsler der Signalquellenwähler XA-U20 oder XA-U40 (getrennt erhältlich) und das Kabel RC-61 (1 m) oder RC-62 (2 m) (getrennt erhältlich) benötigt.

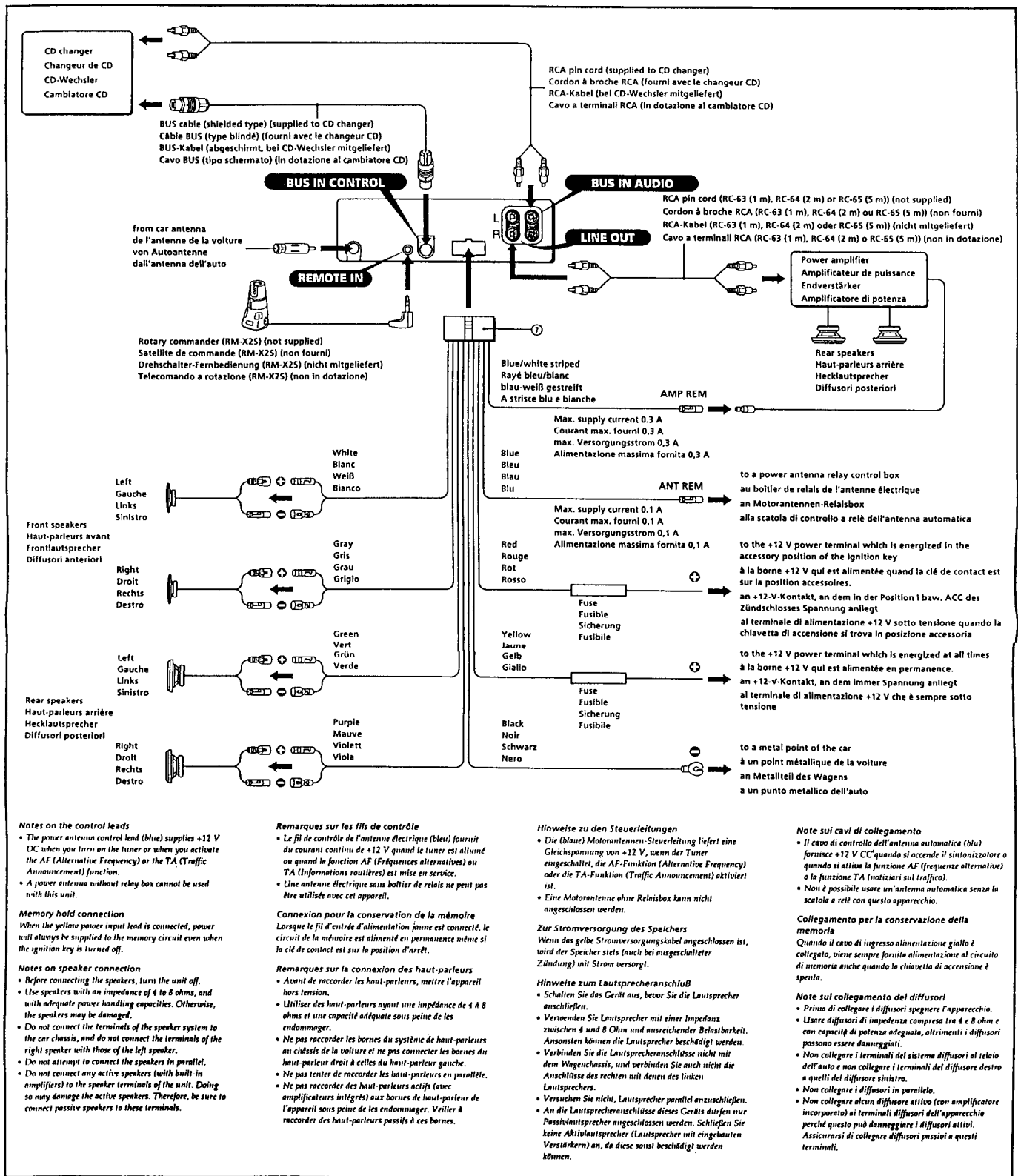
Se si collegano due o più cambia CD o MD, si devono utilizzare il selettore di fonte XA-U20 o XA-U40 (opzionali) e il cavo BUS RC-61 (1 m) o RC-62 (2 m) (opzionali).

Connections of Example

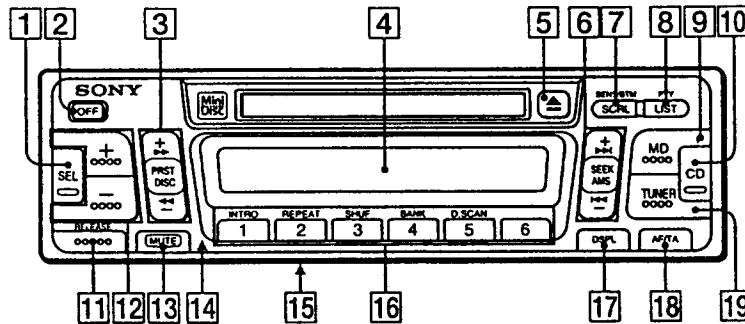
Connexions de l'exemple

Anschlußbeispiel


Esempi di Collegamento



Location of Controls



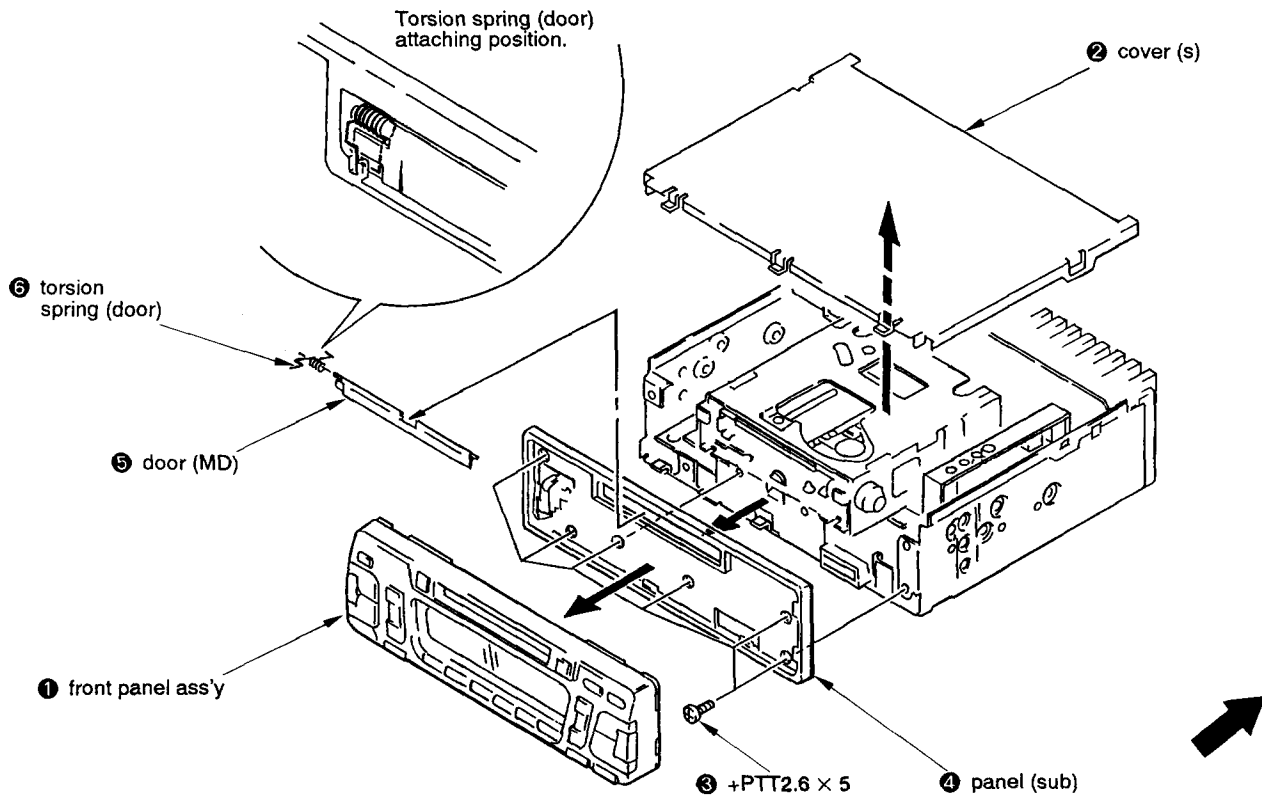
Refer to the pages in ● for details.

- 1 SEL (control mode select/character set) button 5 11 12 13 17 18
- 2 OFF button 4 5 6 13
- 3 PRST/DISC (preset search/disc change) button 7 8 9 14 15
- 4 Display window
- 5 ▲ (eject) button 5 13
- 6 SEEK/AMS (automatic tuning/Automatic Music Sensor) button 6 7 14
- 7 SCRL/SENS/BTM (scroll/sensitivity adjust/Best Tuning Memory function) button 6 7 8
- 8 LIST/PTY (list up/Program Type) button 12 13 17 18
- 9 MD (MD play/MD changer select) button 6 14 15
- 10 CD (CD play/CD changer select) button 6 14 15 17
- 11 RELEASE (front panel release) button 4 19
- 12  (volume/bass/treble/balance/fader control) button 5 13 17 18
- 13 MUTE button 13
- 14 Reset button (located on the front side of the unit hidden by the front panel) 4
- 15 POWER SELECT switch (located on the bottom of the unit)
See "POWER SELECT Switch" in the installation/Connections manual.
- 16 During radio reception:
Preset number buttons 8 9
During MD/CD playback:
 - 1 INTRO (intro scan) button 7 13 15 16
 - 2 REPEAT (repeat play) button 7 12 15 16
 - 3 SHUF (shuffle play) button 7 11 16
 - 4 BANK button 13 16
 - 5 D.SCAN (disc scan) button 14 16
- Direct disc selection buttons 15
- 17 DSPL (display mode change/time set) button 5 6 9 17
- 18 AF/TA (alternative frequency/traffic announcement) button 10 11 (C150RDS)
SENS/BTM (sensitivity adjust/Best Tuning Memory function) 8 (C150)
- 19 TUNER (radio on/band select) button 6 7 8 9

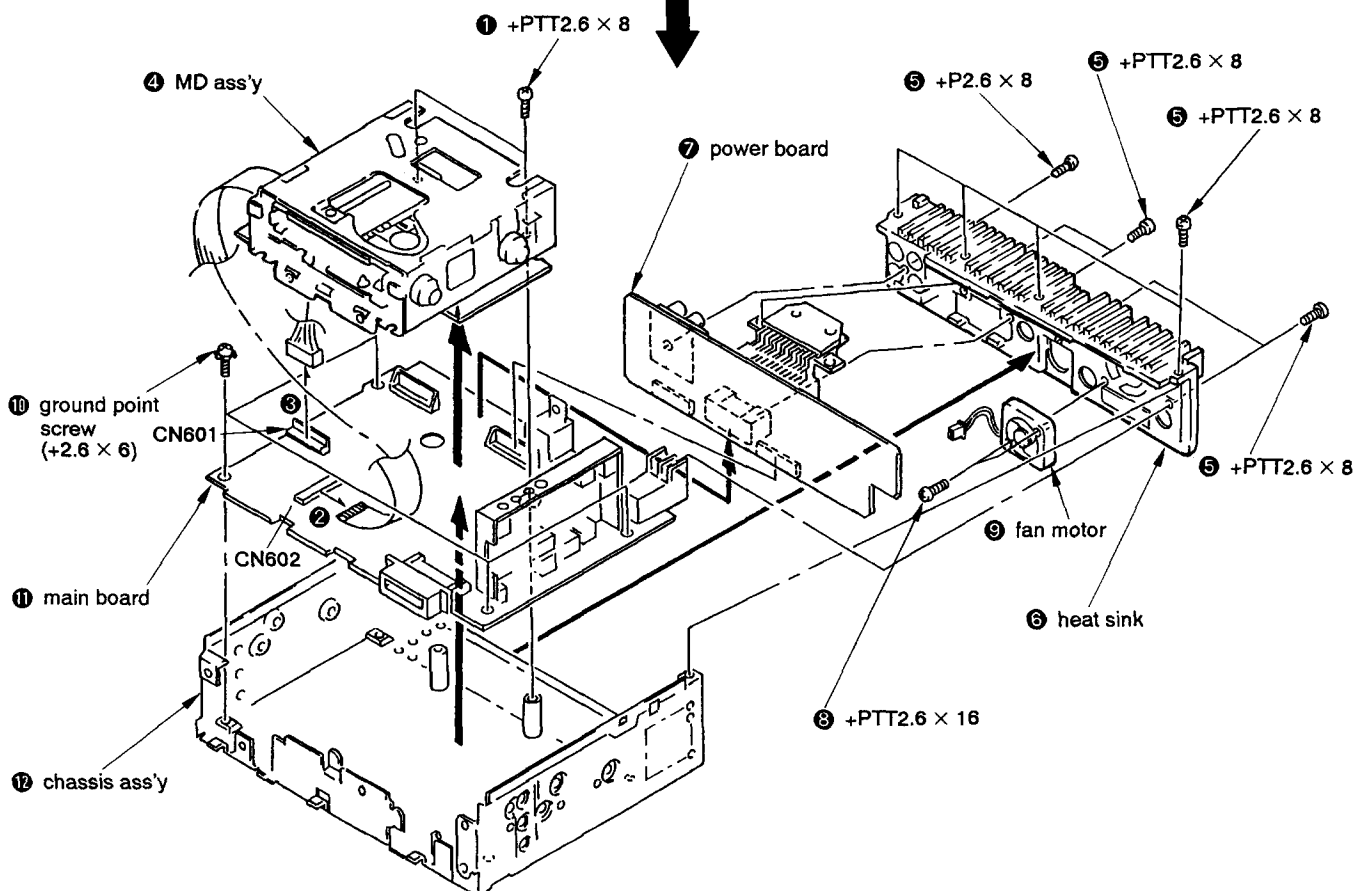
SECTION 2 DISASSEMBLY

Note: Follow the disassembly procedure in the numerical order given.

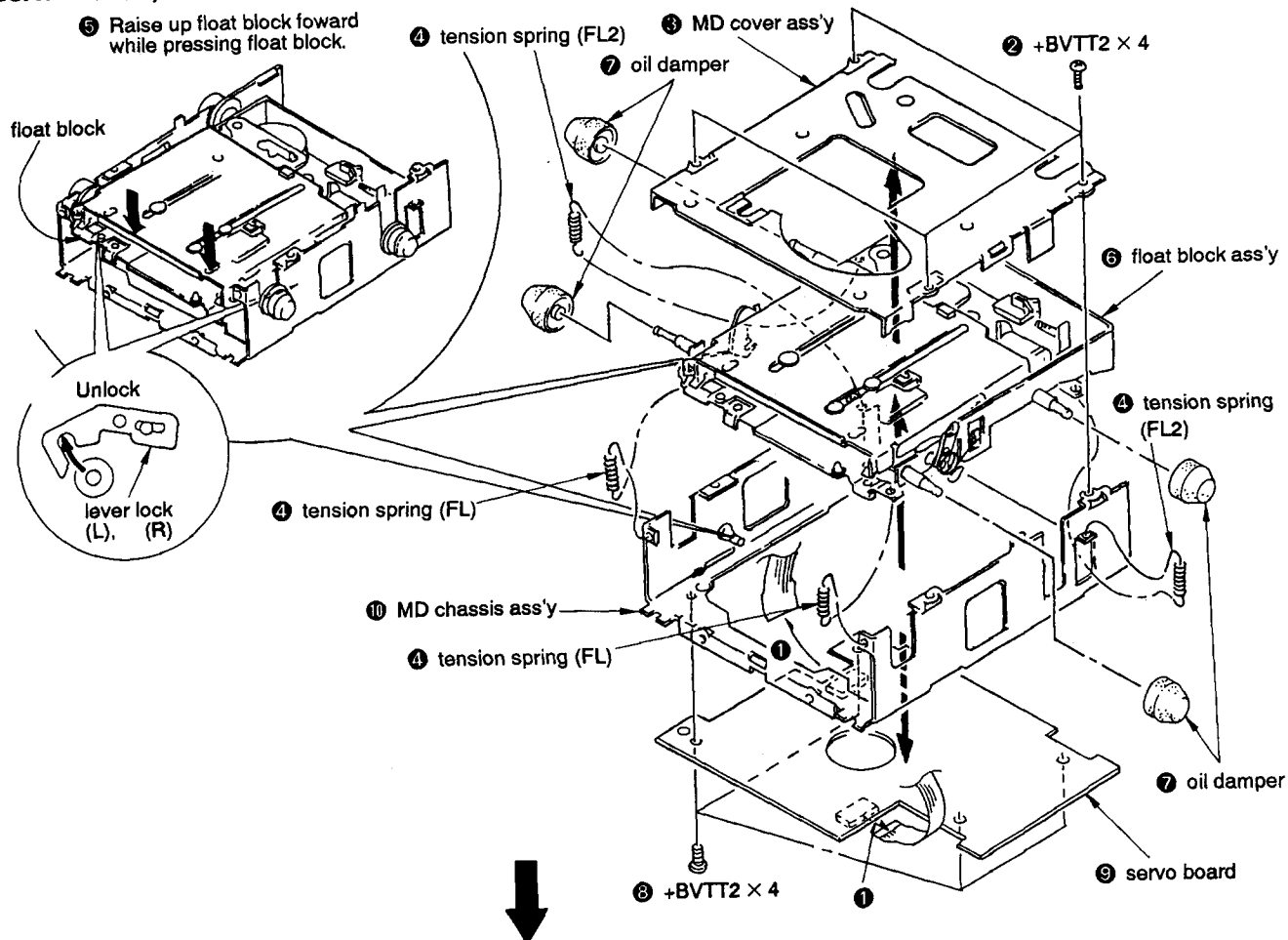
COVER (S), DOOR (MD)



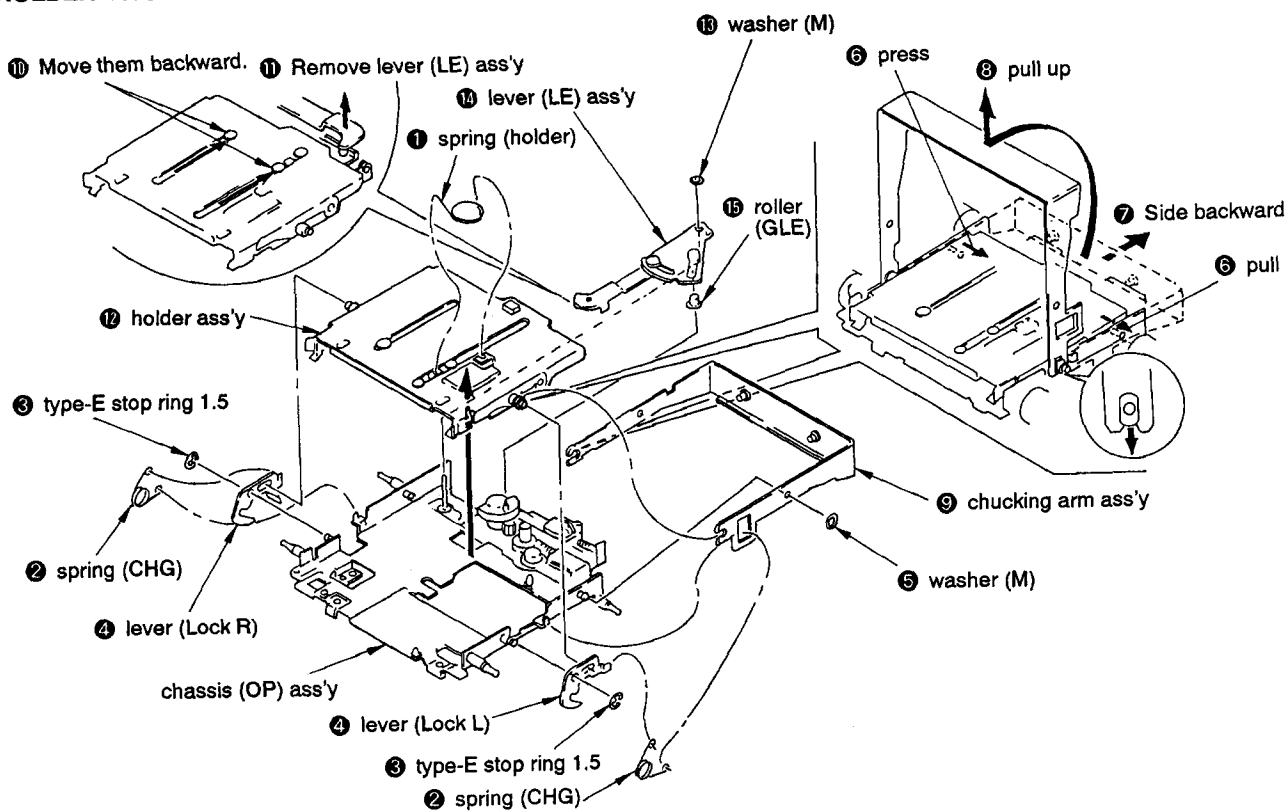
MD ASS'Y, MAIN BOARD, POWER BOARD



FLOAT BLOCK, SERVO BOARD



HOLDER ASS'Y



SECTION 3

TEST MODE

Setting the Test Mode

Operate the steps 1 to 3 shown below without a disc.

1. Press **4**.
2. Press **5**.
3. Press **1** for 2 seconds.






All the display light up and the Test Mode is set.

Note: If a disc is inserted in this case, "SHUF 1" lights up and it becomes VOL MAX PLAY.

When canceling the test mode, press **OFF** button.

Setting and Function of Servo Adjustment Mode

- 1) After the Test Mode, press **MD** button to set Servo Adjustment Mode.
- 2) Function of the each button in Servo Adjustment Mode.

- 1 : FOCUS ON
2 : TRACKING ON/OFF
3 : SLED CENTER
4 : STOP
5 : LASER ON/OFF (Pre-Mastered)
6 : LASER ON/OFF (MO)
-  - PRST/DISC+  : SLED RVS/FWD
-  - SEEK/AMS+  : AMS+ :Loading/Eject
mechanical aging test 1
:AMS - :Loading/Eject
mechanical aging test 2
-  : EJECT
- OFF : RESET (Canceling the Test Mode)

- 3) Insert a disc to press **[1] → [2]**, and it plays without sound. Data is read discontinuously in the PLAY in normal mode, but in this mode, the eye pattern of the continuous reading is observed with oscilloscope. VOL MAX is received with **[TUNER] → [MD]**.
- 4) When canceling Servo Adjustment Mode, press **[TUNER]** or cancel the Test Mode by pressing **[OFF]**.

SECTION 4

ELECTRICAL ADJUSTMENTS

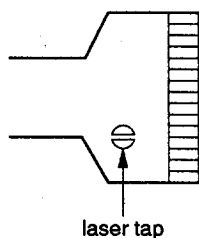
MINI DISC SECTION

4-1. Precaution in the Confirmation of Laser Diode Radiation

Do not look in from the top in confirming the radiation of Laser Diode for fear of the loss of eyesight.

4-2. Precaution in the Handling of Mini-Disc Device (KMS-193A/J-N)

Solder-bridge the laser tap of flexible board in handling the Laser Diode in the optical pick-up since it is very easy to be destroyed in the static electricity. Be fully prepared for the prevention of electrostatic destruction. Be careful in handling the flexible board since it is easy to be cut.



Optical Pick-Up Flexible Board

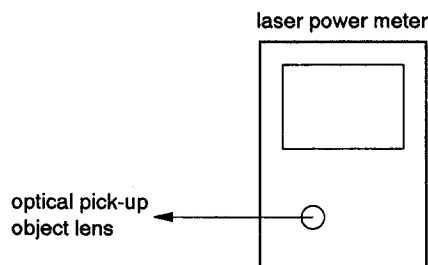
4-3. Precaution in the Adjustment

- 1) All the adjustment should be performed in the order given in the Test Mode. Cancel the Test Mode by pressing **[OFF]** button after the adjustment.
- 2) In some cases, SLED shift by **[<< - PRST/DISC + >>]** button or EJECT movement by **[▲]** button do not work. In those cases, cancel the Test Mode by pressing **[OFF]** button and reset the Test Mode.
- 3) Instrument and measure are shown below.
 - CD Test Disc TDYS-1 (Parts Code: 4-963-646-01)
 - Recorded MO Disc PTDM-1 (Parts Code: J-2501-054-A)
 - Laser Power Meter LPM-8001 (Parts Code: J-2501-046-A)
 - Oscilloscope (Band over 40 MHz. Measure after calibration of probe.)
 - Digital Voltmeter

4-4. Laser Power Adjustment

- 1) Adjustment by Laser Power Meter

Connection:

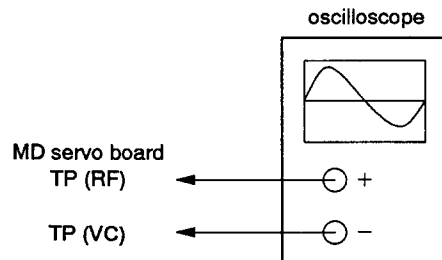


Procedure:

1. Set it Servo Adjustment Mode of the Test Mode.
2. Adjust the position of the optical pick-up with **[<< - PRST/DISC + >>]** and set the Laser Power Meter on the object lens of the optical pick-up.
3. Press **[6]** button.
4. Adjust RV101 so that the Laser Power Meter shows $820 \pm 5 \mu W$.
5. Press **[4]** button.

- 2) Adjustment by an eye pattern.

Connection:



Procedure:

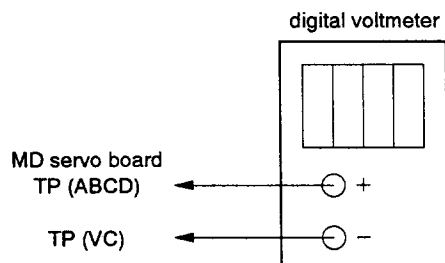
1. Turn RV101 fully counterclockwise.
2. Load and play back the CD Test Disc.
3. Adjust RV101 for an eye pattern of 1.5 Vp-p.



500mV/DIV
0.5 μ sec/DIV

4-5. FOK Offset Adjustment

Connection:

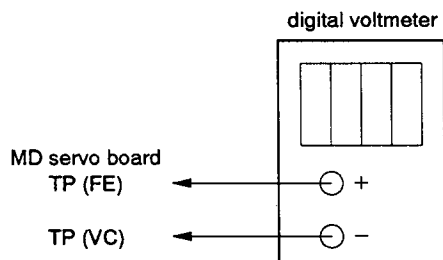


Procedure:

1. Connect a Digital Voltmeter between TP (ABCD) and TP (VC) of MD servo board.
2. Set it Servo Adjustment Mode of the Test Mode.
3. Press **[6]** button.
4. Adjust RV106 for -200 ± 50 mV on the voltmeter.
5. Press **[4]** button.

4-6. Premastered Focus Bias Adjustment

Connection:

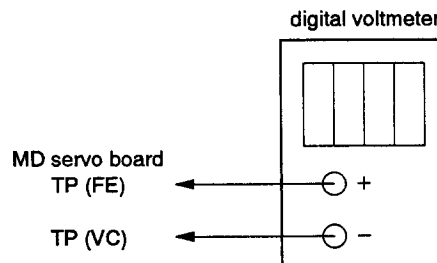


Procedure:

1. Connect a Digital Voltmeter between TP (FE) and TP (VC) of MD servo board.
2. Set it Servo Adjustment Mode of the Test Mode.
3. Press **[5]** button.
4. Adjust RV104 for -100 ± 10 mV on the voltmeter.
5. Press **[4]** button.

4-7. MO Focus Bias Adjustment

Connection:

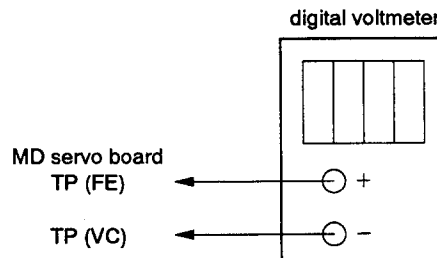


Procedure:

1. Connect a Digital Voltmeter between TP (FE) and TP (VC) of MD servo board.
2. Set it Servo Adjustment Mode of the Test Mode.
3. Press **[6]** button.
4. Adjust RV105 for -300 ± 10 mV on the voltmeter.
5. Press **[4]** button.

4-8. Premastered E-F Balance Adjustment

Connection:

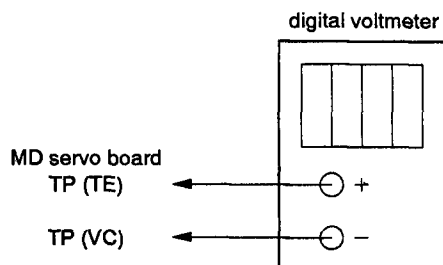


Procedure:

1. Connect a Digital Voltmeter between TP (TE) and TP (VC) of MD servo board.
2. Set it Servo Adjustment Mode of the Test Mode.
3. Load an CD test disc.
4. Press **[4]** → **[3]** → **[1]** button for focus on.
5. Adjust RV107 for 0 ± 50 mV on the voltmeter.
6. Press **[4]** button.
7. Press **[EJECT]** button to eject the disc.

4-9. MO E-F Balance Adjustment

Connection:

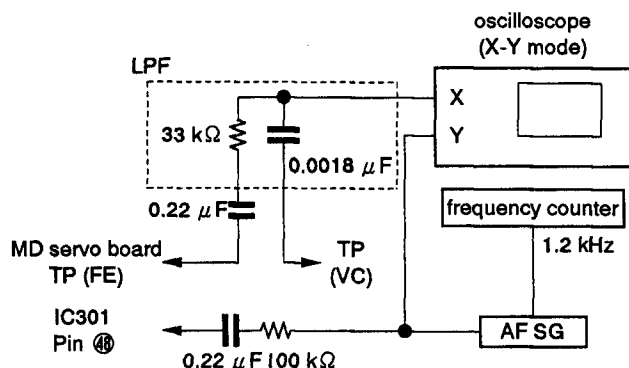


Procedure:

1. Connect the Digital Voltmeter between TP (TE) and TP (VC) of MD servo board.
2. Set it Servo Adjustment Mode of the Test Mode.
3. Load an MO disc.
4. Press **4** → **3** → **1** buttons.
5. Adjust RV108 for 0 ± 50 mV on the voltmeter.
6. Press **4** button.
7. Press **▲** button to eject the disc.

4-10. Focus Gain Adjustment

Connection:



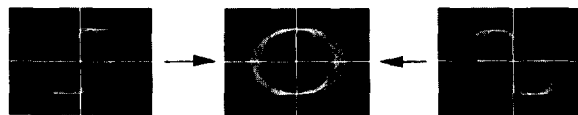
Procedure:

1. Connect as shown above.
2. Set it Servo Adjustment Mode of the Test Mode.
3. Load an MO disc.
4. Press **4** → **3** buttons.
5. Press **1** button for focus on.
6. Press **2** button for tracking.
7. Adjust RV102 so that the waveform observed on the oscilloscope is symmetrical to the vertical line at the center, as shown in figure (b).
8. Press **4** button.
9. Press **▲** button to eject the disc.

Note: The level of ch. 1 (X) and ch. 2 (Y) are different by 10 times. Adjust the range of the oscilloscope so that observation is done in the same level.

(Lissajous Waveform)

Range: ch. 1 (X) = 20 mV
ch. 2 (Y) = 200 mV

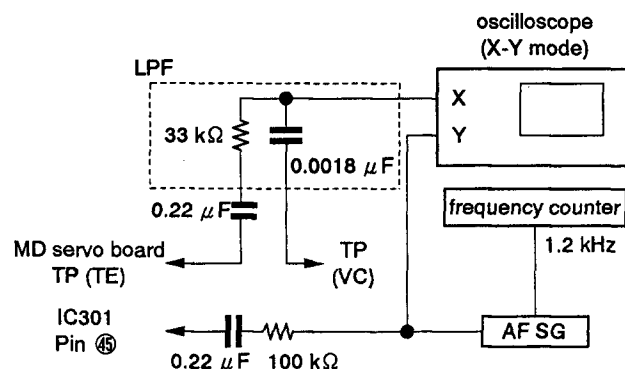


(a) Gain is too low. (b) Gain is appropriate. (c) Gain is too high.

4-11. Tracking Gain Adjustment

1) Method by the Lissajous Waveform.

Connection:



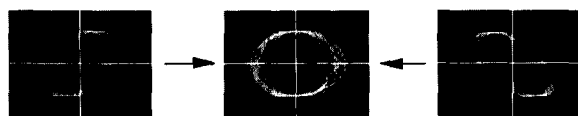
Procedure:

1. Connect as shown above.
2. Set it Servo Adjustment Mode of the Test Mode.
3. Load an MO disc.
4. Press **4** → **3** buttons.
5. Press **1** button for focus on.
6. Press **2** button for tracking.
7. Adjust RV103 so that the Lissajous Waveform on the oscilloscope is circle.
8. Press **4** button.
9. Press **▲** button to eject the disc.

Note: The level of ch. 1 (X) and ch. 2 (Y) are different by 10 times. Adjust the range of the oscilloscope so that observation is done in the same level.

(Lissajous Waveform)

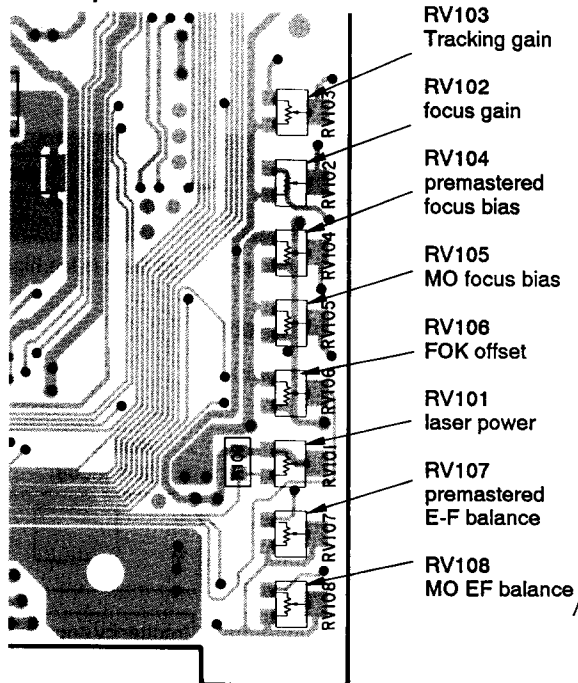
Range: ch. 1 (X) = 20 mV
ch. 2 (Y) = 200 mV



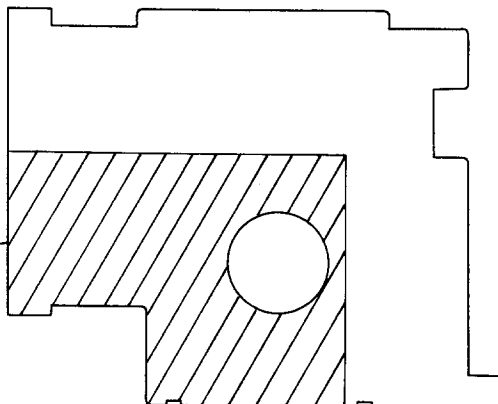
(a) Gain is too low. (b) Gain is appropriate. (c) Gain is too high.

• Adjusting Parts Location

— Component Side —



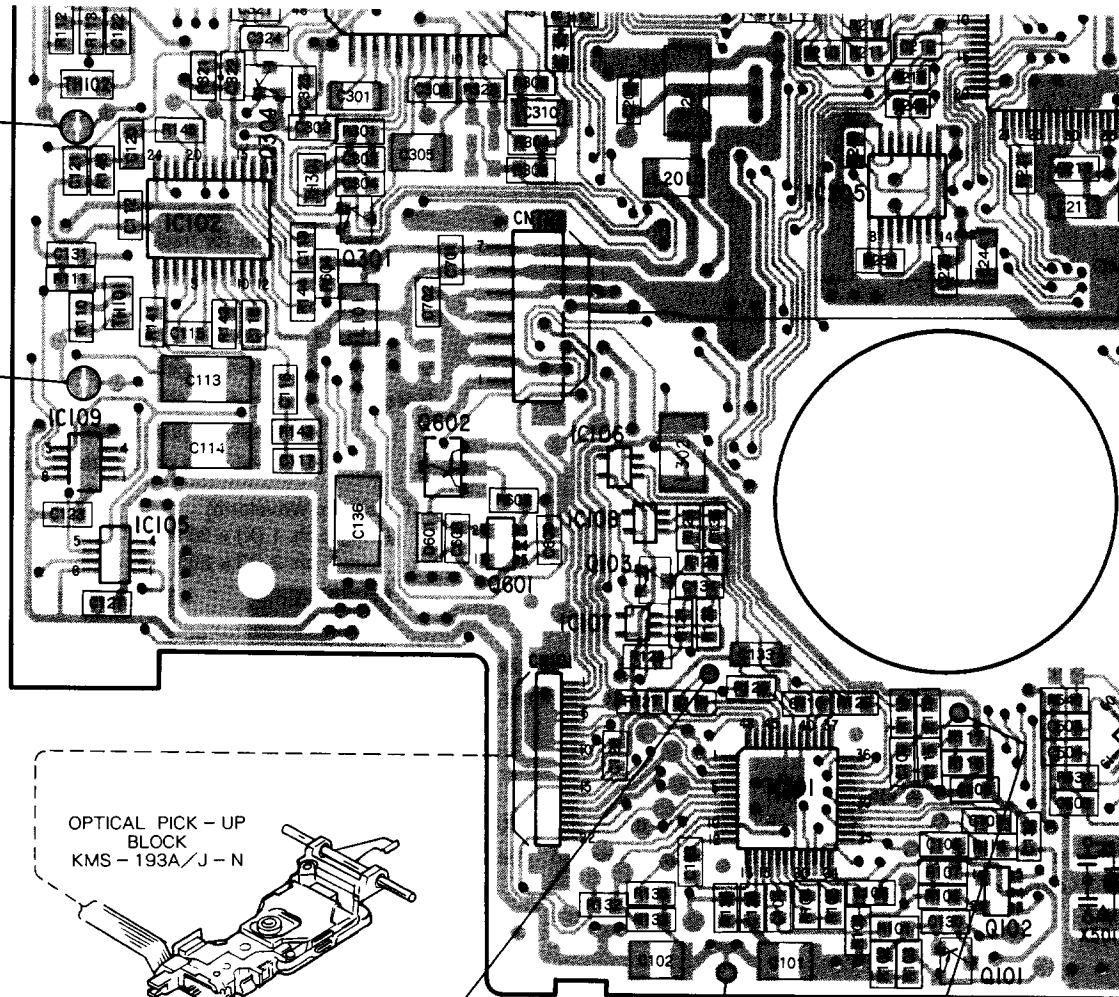
[MD SERVO BOARD]



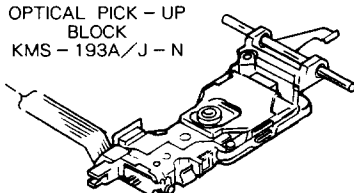
— Conductor Side —

TP (FE)
focus error

TP (TE)
tracking error



OPTICAL PICK - UP
BLOCK
KMS - 193A/J - N



TP (RF)
eye pattern

TP (VC)

TP (ABCD)
FOK offset

TUNER SECTION

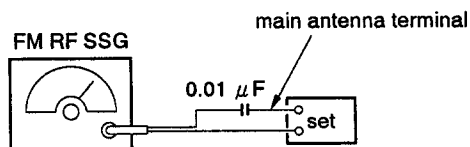
• Precaution in repairing

When front-end part is defective, exchange the whole front-end part since it is difficult to repair its inside.

4-12. FM Auto Scan/Stop Level Adjustment

Setting:

BAND switch: FM

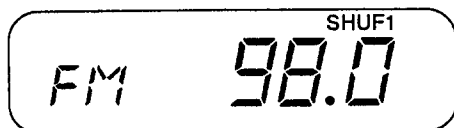


Carrier frequency: 98.0 MHz
Output level: 22 dB
Mode: mono, no modulation

Procedure:

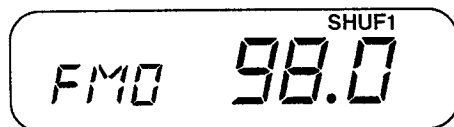
1. Set it the Test Mode.
2. Press the **TUNER** button and set it FM.

Display window



3. Press **SEEK/AMS + >>>** button and adjust the built-in volume RV3 of TU1 so that "FM" indication turns to "FM0" on the display window. When the display window indicates "FM0" before the adjustment, start the adjustment after turning off the "0" indication by turning RV3.

Display window



Standard Value: Stop response 22 dB \pm 3 dB

Note: "0" indication is tuning with the voltage of SD terminal (see page 17).

SD terminal voltage 0 V \rightarrow "0" OFF

SD terminal voltage 5 V \rightarrow "0" ON

4-13. AM Auto Scan/Stop Level Adjustment

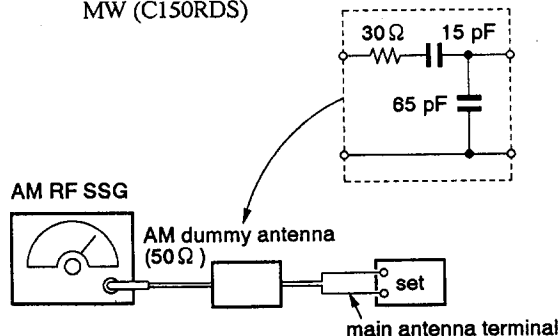
Precaution: This adjustment should be performed after the FM auto scan/stop adjustment.

Setting:

9K/10K switch: 9K (C150)

BAND switch: AM (C150)

MW (C150RDS)

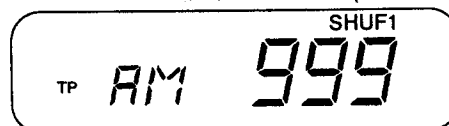


Frequency: 999 kHz
Output level: 33 dB
Modulation: 30% AM modulation

Procedure:

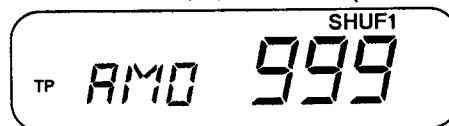
1. Set it Test Mode.
2. Press the **TUNER** button to set AM (MW).

Display window (EX. C150)



3. Press **SEEK + >>>** button and adjust the built-in volume RV1 of TU1 so that "AM" indication turns to "AM0 (MW0)" on the display window. When the display window indicates "AM0 (MW0)" before the adjustment, start the adjustment after turning off the "0" indication by turning RV1.

Display window (EX. C150)



Standard Value: Stop response 33 dB \pm 3 dB

Note: "0" indication is tuning with the voltage of SD terminal (see page 17).

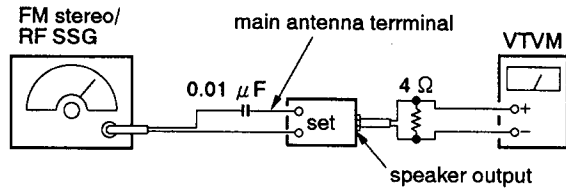
SD terminal voltage 0 V \rightarrow "0" OFF

SD terminal voltage 5 V \rightarrow "0" ON

4-14. High Cut Control Effect Adjustment

Setting:

BAND switch: FM



Carrier frequency: 98.0 MHz
Output level: 60 dB (1 mV)
Mode: mono
Modulation: 10 kHz, 40 kHz deviation

Procedure:

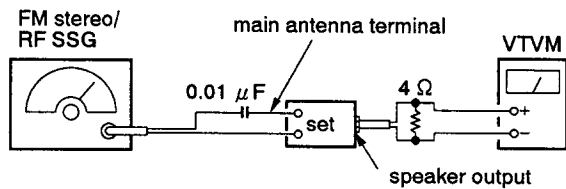
1. Tune it to 98.0 MHz. This output level should be (A) dB.
2. Adjust the built-in volume RV2 of TU1 so that the output level when SSG input is 20 dB is (A) - 6 dB.

Adjustment Location: MAIN board TU1

4-15. FM Noise Convergent Point Adjustment

Setting:

Band switch: FM



Carrier frequency: 98.0 MHz
Output level: 60 dB (1 mV)
Modulation :
main; 1 kHz, 33.75 kHz deviation
sub; 1 kHz, 33.75 kHz deviation
19 kHz pilot; 7.5 kHz deviation

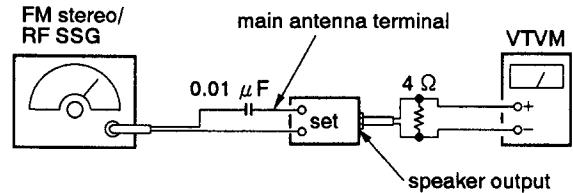
Procedure:

1. Tune it to 98.0 MHz. This output level should be (B) dB.
2. Adjust the built-in volume RV5 of TU1 so that the noise level when SSG input is OFF is (B) - 30 dB.

4-16. FM Stereo Separation (60 dB) Adjustment

Setting:

BAND switch: FM



Carrier frequency: 98.0 MHz
Output level: 60 dB (1 mV)
Modulation :
main; 1 kHz, 33.75 kHz deviation
sub; 1 kHz, 33.75 kHz deviation
19 kHz pilot; 7.5 kHz deviation

Procedure:

1. Adjust the built-in volume RV4 of TU1 for the best separation.

FM stereo signal generator output channel	VTVM connection	VTVM reading (dB)
L-CH	L-CH	Ⓐ
R-CH	L-CH	Ⓑ [ⓑ] Adjust RV4 for VTVM minimum reading.
R-CH	R-CH	Ⓒ
L-CH	R-CH	Ⓓ [Ⓓ] Adjust RV4 for VTVM minimum reading.

L-CH Stereo separation: Ⓐ - Ⓑ

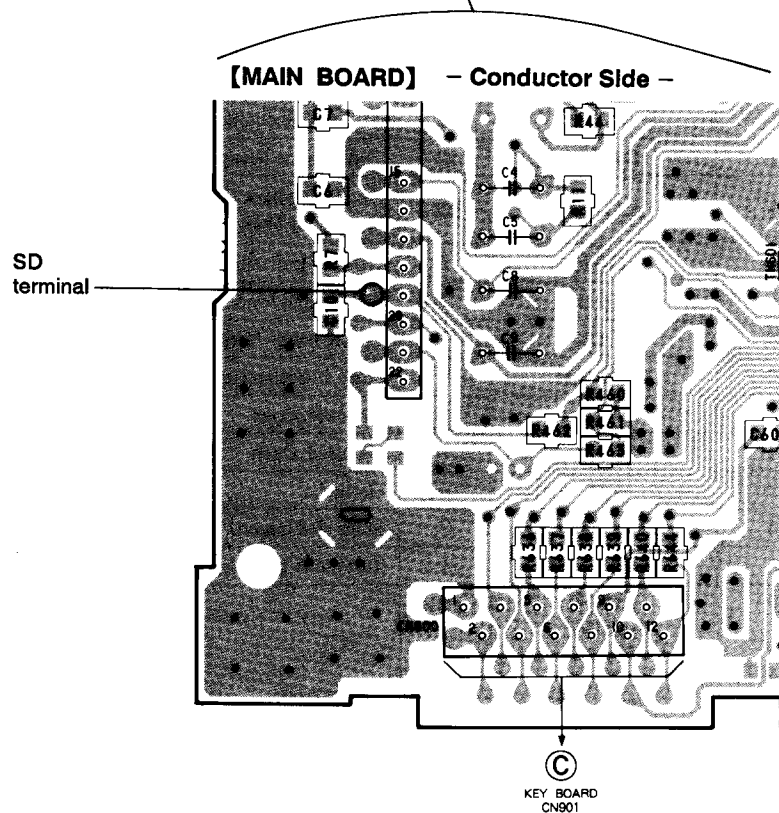
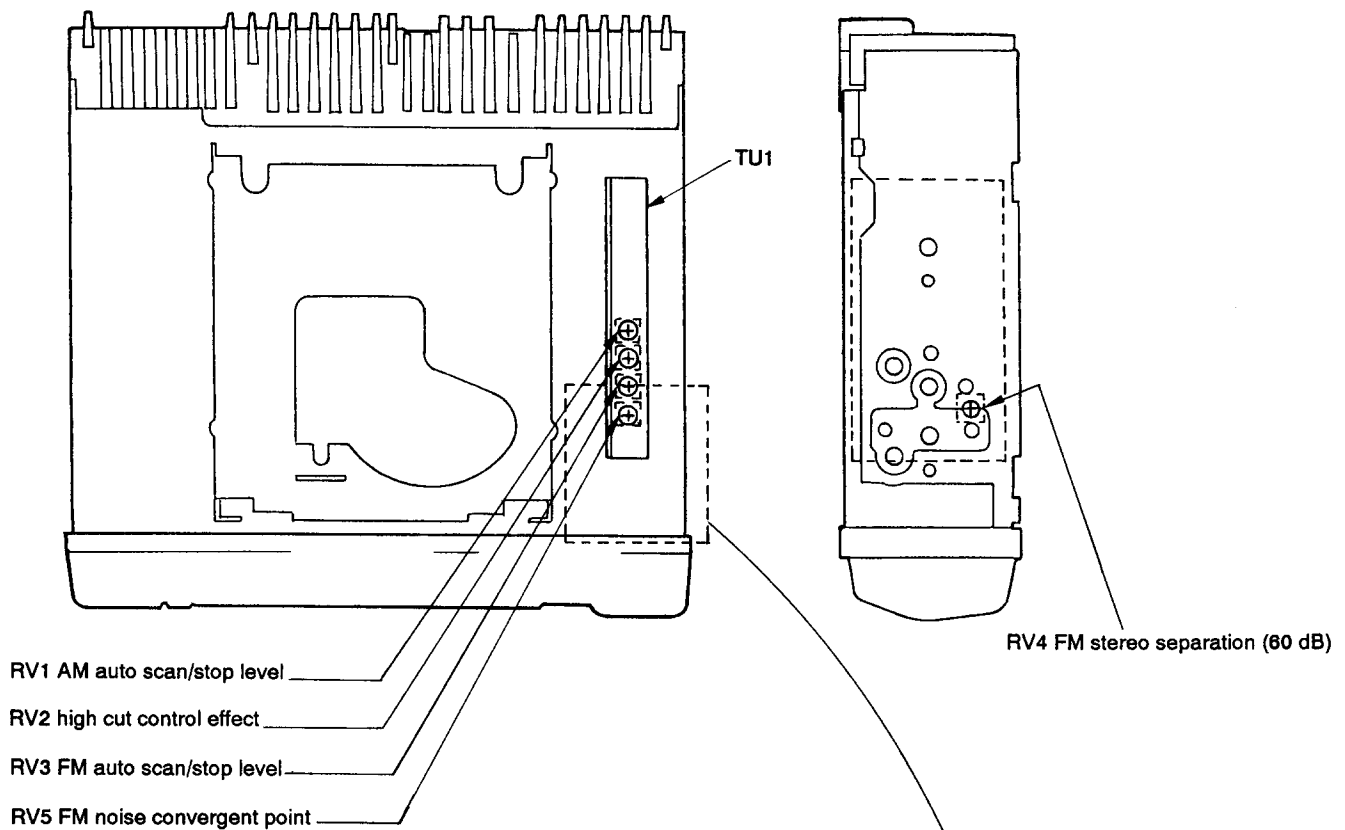
R-CH Stereo separation: Ⓒ - Ⓓ

The separations of both channels should be equal.

Adjustment Location: MAIN board TU1

Standard Value: Separation over 30 dB.

● Adjusting Parts Location



SECTION 5

DIAGRAMS

5-1. IC PIN FUNCTION DESCRIPTION

IC501 μ PD78054GC-056-3B9 (SERVO BOARD)

Pin No.	Pin Name	I/O	Description
1	N.C	—	Not used. Open.
2	A.OUT SEL	I	Analog out or not initial setting terminal.
3	D.OUT SEL	I	Digital out or not initial setting terminal.
4	AVSS	—	Ground for AD input.
5	N.C	—	Not used. Open.
6	RMS	—	Not used. Open.
7	AV REF1	—	Not used. Connected to ground.
8	PC RXD	—	Not used. Connected to ground.
9	PC TXT	—	Not used. Open.
10	N.C	—	Not used. Open.
11	SRDT	I	Data for serial communication with ICs for MD (CXA1082, CXD2525, CXD2526, CXD2531) input.
12	SWDT	O	Data for serial communication with ICs for MD output.
13	SCK	O	Shift clock for serial communication with ICs for MD output.
14	REQUEST	O	Request output for UNI-LINK serial interface.
15	LINK OFF	O	LINK OFF output for UNI-LINK serial communication.
16	DATA IN	I	Serial data input.
17	DATA OUT	O	Serial data output.
18	CLK	I	Serial clock input.
19	AGC SW	O	"H": Starts focusing. "L": Focusing is end.
20	MIRR SW	O	On playing back CD disc pit: Fixed to low. On playing back MO disc groove: High=Normal, Low=On track jump operation and on the time from CLV, tracking, sled servo goes on to starting is OK.
21	MD ON	O	Controls power supply for MD servo IC.
22	RST	O	Reset output to ICs for MD.
23	LAT	O	Data latch when transmitting serial data to ICs for MD.
24	MUTE	O	Audio mute output.
25	DEEMP	O	Turns on the deemphasis circuit.
26	ASY SW	O	On playing back CD disc pit: Fixed to high. On playing back MO disc groove: High=Normal, Low=On track jump operation.
27	CD/MO	I	CD/MO (reflecting rate) discrimination. High: High reflection, Low: Low reflection
28	SENS	I	SENS input from ICs for MD.
29	LOCK	I	LOCK input. "High" : CLV lock, "Low" : CLV unlock
30	DFST SW	O	High: Focusing starts. Low: All servo (Focus, CLV, Tracking, sled) is on.
31	N.C	—	Not used. Open.
32	N.C	—	Not used. Open.
33	VSS	—	Ground.
34	SLO MUTE	O	Stops sled motor.
35	TEST MODE	I	Test mode initial setting terminal.
36 37 38 39 40 41 42 43	TSTIN0 TSTIN1 TSTIN2 TSTIN3 TSTOUT0 TSTOUT1 TSTOUT2 TSTOUT3	—	Test terminal.

Pin No.	Pin Name	I/O	Description															
44	COM ERROR	—	Not used. Open.															
45	DIRC	O	Tracking jump direct control.															
46	SBMN	O	“H”: Sub data control, “L”: Main data control.															
47	WRMN	O	“H”: DRAM write, “L”: Main data control.															
48	LD POWER	O	Laser power control. “L”: On low reflecting rate disc (MO), “H”: On high reflecting rate disc (CD).															
49	LD ON	O	Laser on/off output. “H”: LASER OFF, “L”: LASER ON.															
50	RF SW1	O	Disc mode. “H”: On pit, “L”: Groove.															
51	RF SW0	O	Disc mode. “H”: On CD, “L”: On MO.															
52	LM_EJ	O	Loading/Eject motor control. <table border="1"><thead><tr><th>LM_EJ</th><th>LM_LOD</th><th>CONTENTS</th></tr></thead><tbody><tr><td>HIGH</td><td>LOW</td><td>EJECT</td></tr><tr><td>LOW</td><td>HIGH</td><td>LOAD</td></tr><tr><td>HIGH</td><td>HIGH</td><td>BRAKE</td></tr><tr><td>LOW</td><td>LOW</td><td>STOP</td></tr></tbody></table>	LM_EJ	LM_LOD	CONTENTS	HIGH	LOW	EJECT	LOW	HIGH	LOAD	HIGH	HIGH	BRAKE	LOW	LOW	STOP
LM_EJ	LM_LOD	CONTENTS																
HIGH	LOW	EJECT																
LOW	HIGH	LOAD																
HIGH	HIGH	BRAKE																
LOW	LOW	STOP																
53	LM_LOD	O																
54	MECHA ON	O	Power supply on/off switch for mechanism deck.															
55	E SW	I	MD cartridge loading end sensor.															
56	R SW	—	Not used. Connected to ground.															
57	N.C	—	Not used. Open.															
58	IM/4M	I	DRAM capacity initial setting.															
59	N.C	—	Not used. Open.															
60	RESET	I	Reset input.															
61	B/U CHECK	I	Detects backup power supply.															
62	BUS ON	I	BUS on control.															
63	C SW	I	Cartridge insertion detection switch.															
64	FOK	I	Detects focus servo is on.															
65	SQSY	I	SUBQ SYNC interruption.															
66	ATSY	I	ADIP SYNC interruption.															
67	INT	I	CXD2526 interruption.															
68	VDD	—	Power supply.															
69	X2	O	Main ceramic oscillator output.															
70	X1	I	Main ceramic oscillator input.															
71	IC	—	Ground.															
72	N.C	—	Not used. Open.															
73	N.C	—	Not used. Connected to ground.															
74	AVDD	—	Power supply for A/D conversion.															
75	AVREF0	—	Reference power supply for A/D conversion.															
76	TEMP	I	High temperature check.															
77	N.C	—	Not used. Open.															
78	N.C	—	Not used. Open.															
79	N.C	—	Not used. Open.															
80	N.C	—	Not used. Open.															

IC400 μ PD78056GC-076-3B9 (MAIN BOARD)

Pin No.	Pin Name	I/O	Description												
80	DSTSEL0	I	AD input. Read on reset.												
			<table><tr><td>DEST SEL0</td><td>0~1.23 V</td><td>1.25~2.48 V</td><td>2.50~3.73 V</td><td>3.75~5.00 V</td></tr><tr><td>DEST SEL1</td><td></td><td></td><td></td><td></td></tr></table>	DEST SEL0	0~1.23 V	1.25~2.48 V	2.50~3.73 V	3.75~5.00 V	DEST SEL1						
			DEST SEL0	0~1.23 V	1.25~2.48 V	2.50~3.73 V	3.75~5.00 V								
			DEST SEL1												
<table><tr><td>0~1.23 V</td><td>J AM MONO</td><td>J AM ST</td><td>AE (ARI)</td><td>TUNER External</td></tr></table>	0~1.23 V	J AM MONO	J AM ST	AE (ARI)	TUNER External										
0~1.23 V	J AM MONO	J AM ST	AE (ARI)	TUNER External											
<table><tr><td>1.25~2.48 V</td><td>AE</td><td>AE SW</td><td>AE LW</td><td>AE SW (ARI)</td></tr><tr><td>2.50~3.73 V</td><td>EE</td><td>EE SW</td><td>EE LW</td><td>AE LW (ARI)</td></tr><tr><td>3.75~5.00 V</td><td>E 9K</td><td>E 10K</td><td>EA</td><td>U/CA</td></tr></table>	1.25~2.48 V	AE	AE SW	AE LW	AE SW (ARI)	2.50~3.73 V	EE	EE SW	EE LW	AE LW (ARI)	3.75~5.00 V	E 9K	E 10K	EA	U/CA
1.25~2.48 V	AE	AE SW	AE LW	AE SW (ARI)											
2.50~3.73 V	EE	EE SW	EE LW	AE LW (ARI)											
3.75~5.00 V	E 9K	E 10K	EA	U/CA											
1	DSTSEL1	I													
2	S METER	I	Detects S meter voltage.												
3	KEY ACT	O	Turns on the power for AD input and reference POWER.												
4	AVSS	—	Ground for AD input.												
5	ST/MONO	I/O	Stereo input. Monaural output (FM mode). Input mode: Stereo indication/Not indication select by ON/OFF switching. Output mode: “ON” output when force mono is requested.												
6	PLL CE	O	PLL serial chip enable output.												
7	AV REF1	—	Reference power supply for D/A conversion.												
8	PLL SI	I	PLL serial data input.												
9	PLL SO	O	PLL serial data output.												
10	PLL CLK	O	PLL serial clock output.												
11	N.C	—	Not used. Open.												
12	LCD SO	O	LCD serial data output.												
13	LCD CLK	O	LCD serial clock output.												
14	LCD STB	O	LCD chip select output.												
15	UNI CK O	O	UNI-LINK serial interface clock output.												
16	UNI SI	I	UNI-LINK serial interface data input.												
17	UNI SO	O	UNI-LINK serial interface data output.												
18	UNI CKI	I	UNI-LINK serial interface clock input.												
19	BUS ON	O	BUS ON control. “L”: UNI-LINK communication is active.												
20	LCD OFF	O	LCD command/data select. “H”: Command. “L”: Data.												
21	ANT REM	O	Antenna remote control. “H”: Active.												
22	POWER ON/AMP ON	O	System power supply on/off control. “H”: On.												
23	SUB CE	—	Not used. Open.												
24	SUB CLK	—	Not used. Open.												
25	SUB SO	—	Not used. Open.												
26	N.C	—	Not used. Open.												
27	VOL CE	O	Electronic volume serial chip enable output.												
28	VOL CLK	O	Electronic volume serial clock output.												
29	VOL SO	O	Electronic volume serial data output.												
30	AU SEL0	—	Not used. Open.												
31	AU SEL1	—	Not used. Open.												
32	MUTE	O	Mute control at audio signal output stage. “H”: Mute on.												
33	VSS	—	Ground.												
34	AUX MUTE	—	Not used. Open.												
35	TU MUTE	O	Tuner mute control. “H” : Mute on.												

Pin No.	Pin Name	I/O	Description
36	TV	—	Not used. Connected to ground.
37	CAUTION ALM	I	Caution alarm control. "H": Off. "L": On.
38	LOUD	I	LOUD function is built in or not. "H": Built in. "L": Not built in.
39	SUB VOL	I	Sub volume is built in or not. "H": Built in. "L": Not built in.
40	TIME POLLING	I	Time polling is built in or not. "H": Built in. "L": Not built in.
41	TEST	I	Detects test mode. "H": Test mode.
42	TEL MUTE	I	Telephone mute input. "L": Attenuates — 20dB.
43	N.C	—	Not connected. Open.
44	N.C	—	Not connected. Open.
45	ILL ON	O	Illumination power supply control.
46	BEEP	O	Buzzer control.
47	COLOR	I	Illumination color select control.
48	AM ON	O	AM power supply control.
49	FM ON	O	FM power supply control.
50	SYS RESET	O	System reset control. "L": Reset.
51	N.C	—	Not used. Open.
52	N.C	—	Not used. Open.
53	N.C	—	Not used. Open.
54	N.C	—	Not used. Open.
55	P.SEL SW	I	Power select initial setting terminal.
56	RAM RES	I	Detects RAM reset.
57	SD IN	I	Detects SD. Sets the level for seek BTM.
58	N.C	—	Not used. Connected to ground.
59	N.C	—	Not used. Connected to ground.
60	RESET	I	Reset input. "L": Reset.
61	SIRCS	—	Not used. Connected to ground.
62	B.U CHECK	I	Detects. Back-up power supply.
63	ACK CHECK	I	Key input acknowledge. "H": On.
64	N.C	—	Not used. Open.
65	N.C	—	Not used. Open.
66	NOSE SW	I	Detects front panel assy is attached or not. "L": Attached.
67	KEY ACK	I	Key input acknowledge.
68	VDD	—	Power supply.
69	X2	O	Main ceramic oscillator output.
70	X1	I	Main ceramic oscillator input.
71	IC	—	Ground.
72	XT2	O	Sub crystal oscillator output.
73	XT1	I	Sub crystal oscillator input.
74	AVDD	—	Power supply for A/D conversion.
75	AVREF0	—	Reference power supply for A/D conversion.
76	KI0	I	Key input.
77	KI1	I	Key input.
78	ROT IN0	I	Rotary commander input. *1
79	ROT IN1	I	Rotary commander "SHIFT" input. *1

*1: Rotally commander connect key function.

	KEY FUNCTION		AD LEVEL	
	ROT IN0	ROT IN1	center	Detecting range
SW1	OFF	←	0 V	0~0.16 V
SW2	SOURCE	←	0.90 V	0.18~1.13V
SW3	MUTE	←	1.21 V	1.15~1.29 V
SW4	MODE	←	1.58 V	1.31~1.86 V
SW5	AMS/SEEK/MANU+	DISC/PRESET+	2.05 V	1.88~2.30 V
SW6	AMS/SEEK/MANU –	DISC/PRESET –	2.52 V	2.32~2.79 V
SW7	VOL UP (DOWN)	←	2.99 V	2.81~3.30 V
SW8	VOL DOWN (UP)	←	3.42 V	3.32~3.63 V
SW9	SEL	Reverse by pressing 2 seconds	3.81 V	3.65~3.96 V
SW10	LIST	←	4.12 V	3.98~4.30 V

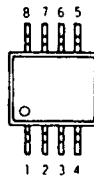
IC450 MN1883220SZG (MAIN BOARD)

Pin No.	Pin Name	I/O	Description
1	A5	O	S-RAM ADDRESS control output. Not used.
2	A4		
3	A3		
4	A2		
5	A1		
6	A0		
7	VDD	—	Power supply pin.
8	X1	—	Connecting pins of the ceramic oscillator.
9	X2	—	
10	GND	—	
11	XTI	—	Not used.
12	XTO	—	
13	XO	—	Connected to GND.
14	RESET	I	Reset input pin.
15	RDS CLK	I	RDS CLK input pin.
16	BU CHECK	I	BACK-UP detection.
17	BUS ON	I	BUS INTERFACE ON/OFF detection.
18	D7	I/O	S-RAM DATA BUS. Not used.
19	D6		
20	D5		
21	D4		
22	D3		
23	D2		
24	D1		
25	D0		
26	RE	O	S-RAM READ ENABLE output. Not used.
27	WE	O	S-RAM WRITE ENABLE output. Not used.
28	—	—	Not used.
29	—	—	
30	RDS DATA	I	RDS DATA input.
31	FM AMS IN	I	Not used.
32	AM ST IN	I	Not used.
33	—	—	Not used.
34	—	—	
35	—	—	
36	—	—	Connected to GND.
37	—	—	
38	PLL DI	I	PLL DATA input.
39	PLL DO	O	PLL DATA output.
40	PLL CLK	O	PLL CLK output.

Pin No.	Pin Name	I/O	Description
41	PLL CE	O	PLL CE output.
42	RQ	O	BUS REQUEST output.
43	LINK OFF	O	Not used.
44	SCK	I	BUS INTERFACE CLK input.
45	SI	I	BUS INTERFACE DATA input.
46	SO	O	BUS INTERFACE DATA output.
47	VDD	—	Power supply pin.
48	AVDD	—	power supply pin. (For A/D conversion ports.)
49	VREF+	I	Reference voltage input pin.
50	—	—	Connected to GND.
51	—		
52	SRAM RST	I	Reset signal input.
53	MUTE SEL	I	Mute selecting signal input.
54	MS1	I	Mode select input.
55	MS2	I	
56	AM S METER	I	S-METER voltage detection input. AM (MW : SW : LW)/FM
57	FM S METER	I	
58	VREF —	I	Connected to GND.
59	—	—	Connected to GND.
60	VSS	—	
61	TU ON	O	Not used.
62	\overline{DX}/LO	O	Not used.
63	SEEK	O	SEEK OUT output.
64	AM ON	O	Not used.
65	FM ON	O	FM ON output.
66	TUNER MUTE	O	MUTE output.
67	AF SEEK	O	AF SEEK OUT output.
68	SRAM	O	External S-RAM control output. Not used.
69	A15	O	Not used.
70	ST IN MONO	I	Stereo input pin.
71	SD IN	I	SD input pin.
72	A14	O	Not used.
73	A13	O	
74	CE	O	S-RAM CE output. Not used.
75	A11	O	Not used.
76	A10		
77	A9		
78	A8		
79	A7		
80	A6		

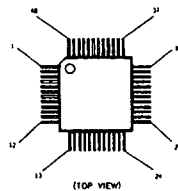
• Semiconductor Lead Layouts

BA6287F
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μ PC4558G2



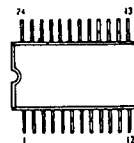
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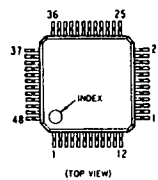
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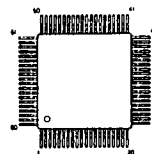
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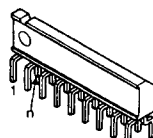


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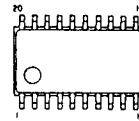
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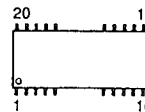
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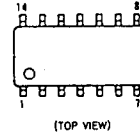
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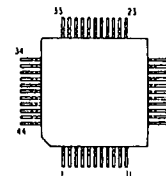


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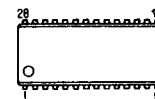


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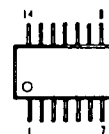
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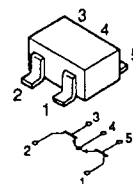


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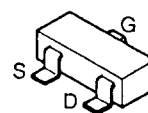


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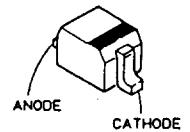
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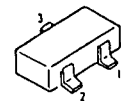
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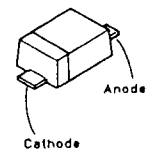
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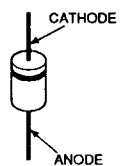
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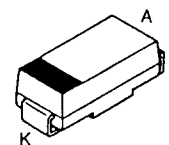
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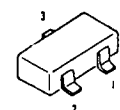
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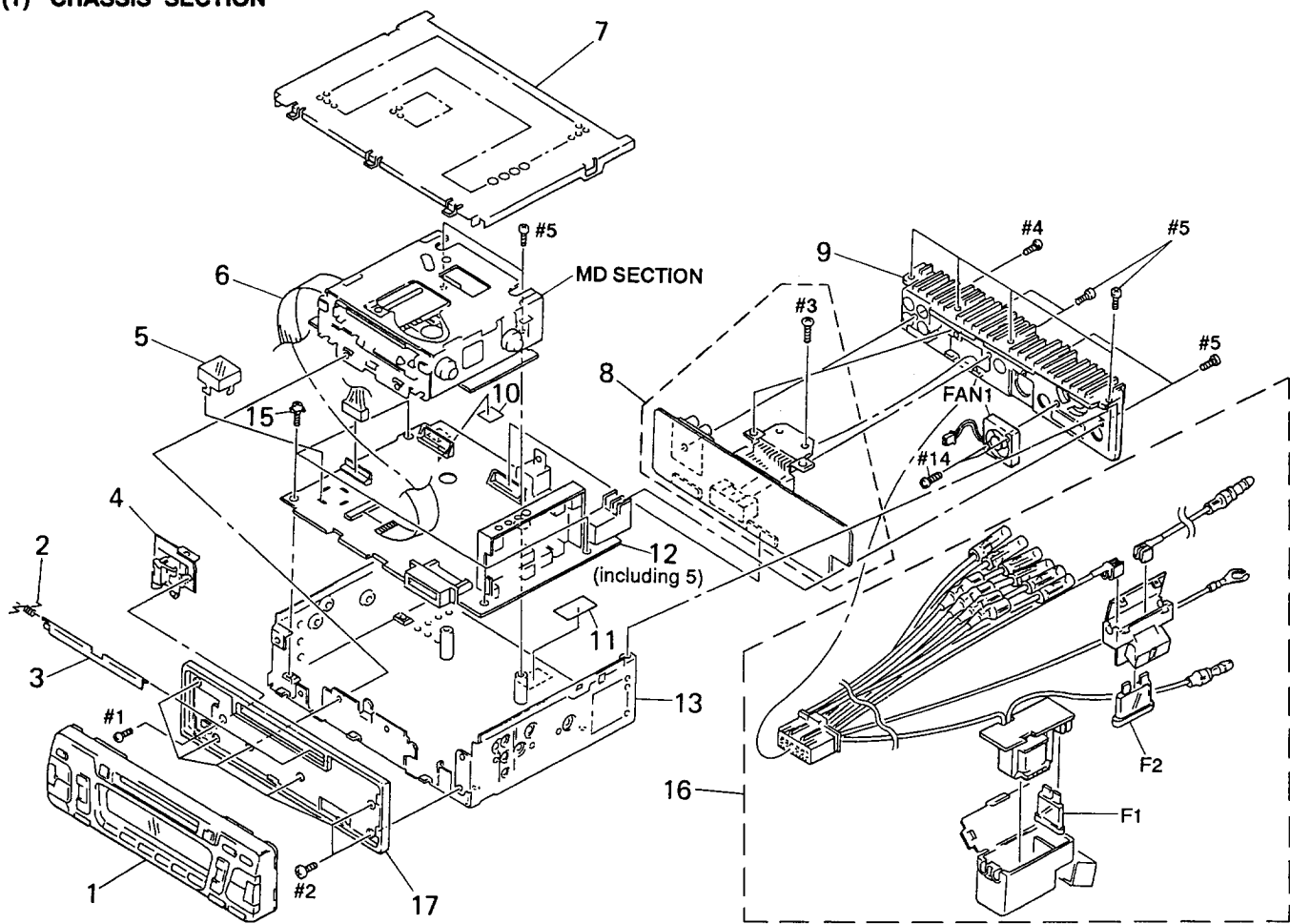
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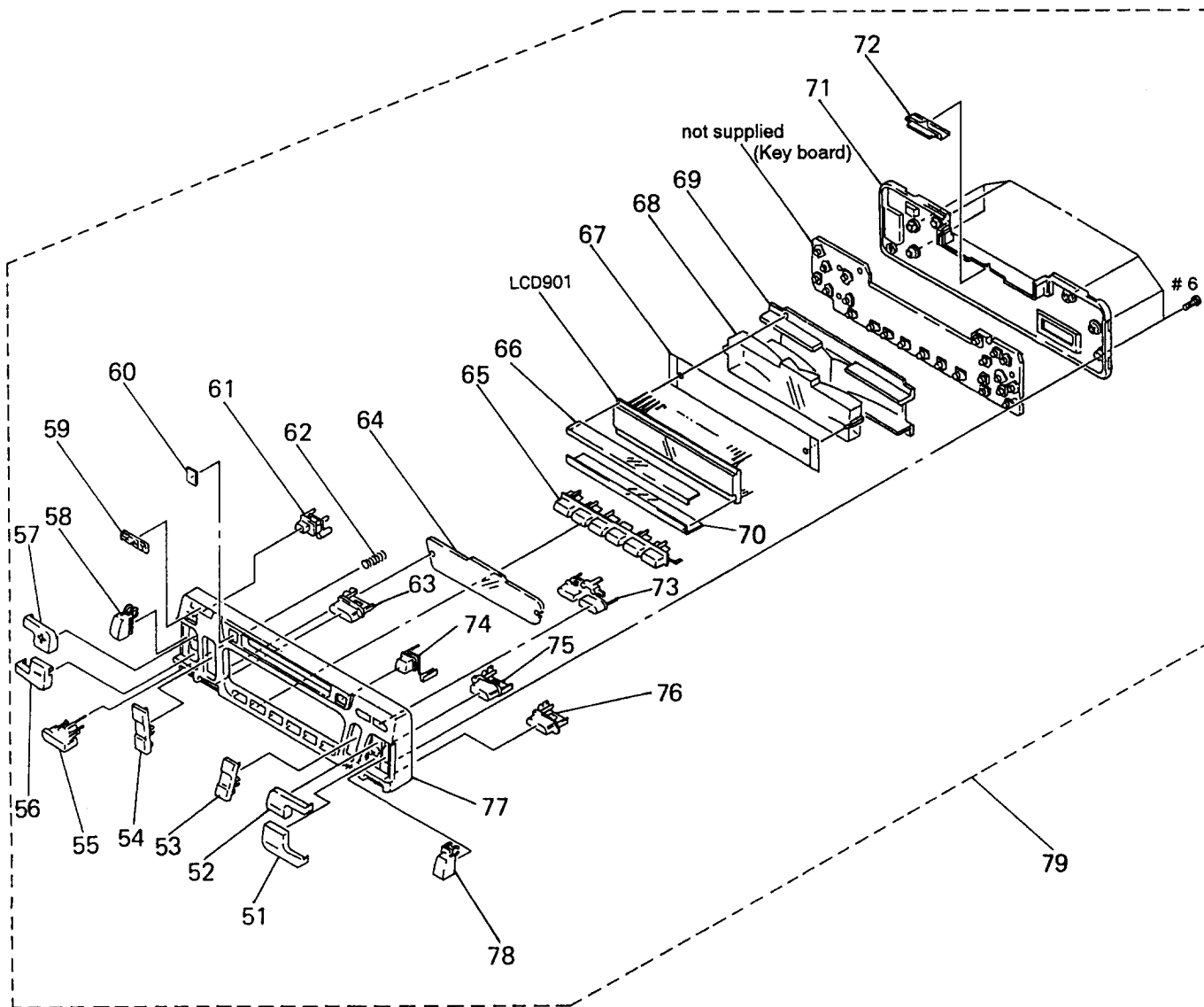
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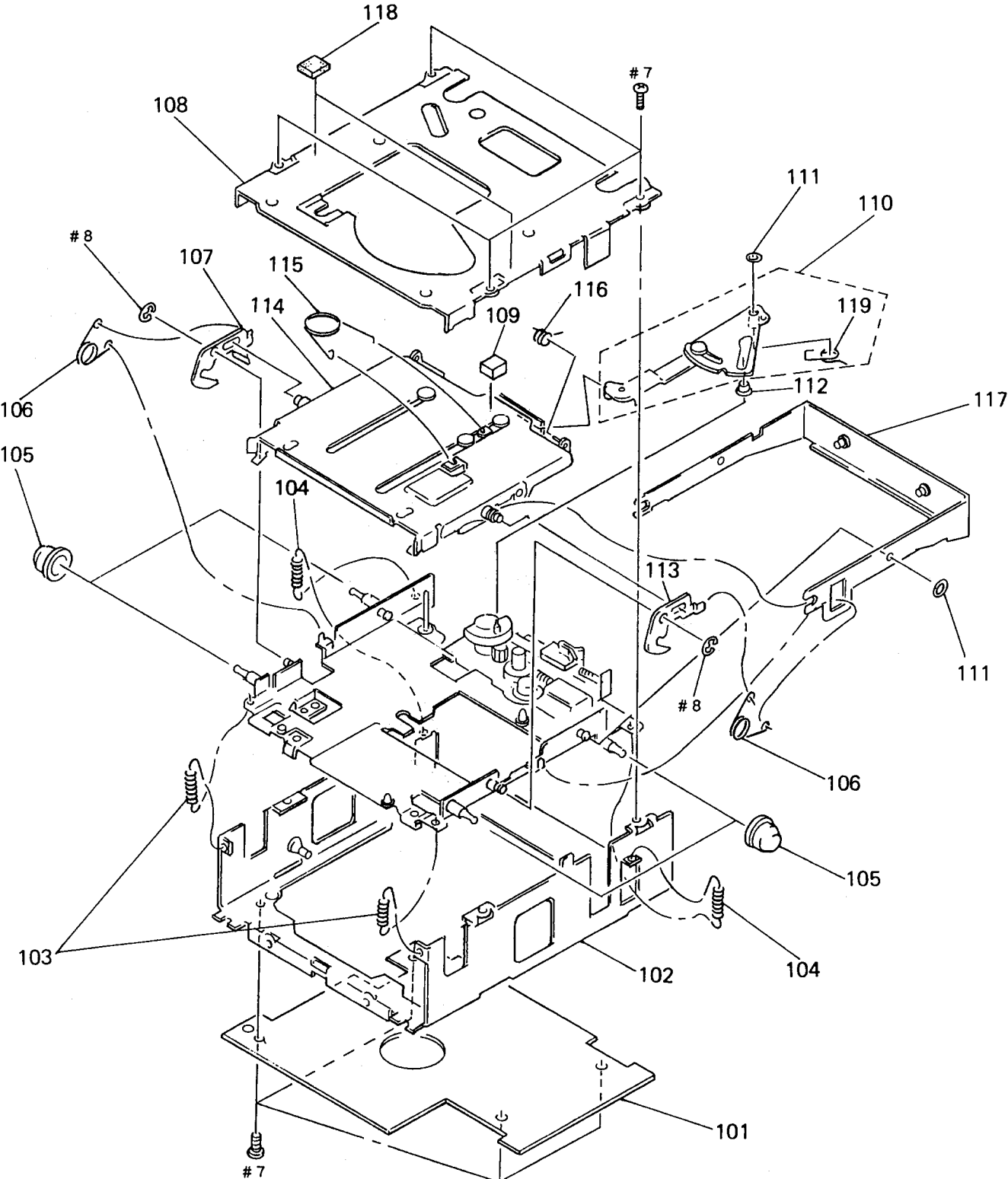
(1) CHASSIS SECTION



(2) FRONT PANEL SECTION



(3) MD SECTION-1



(4) MD SECTION-2

